



The determinant of educational mismatch and its correlation to wages

Ferry Maurist Sitorus ^{1*}, Padang Wicaksono²

¹ Master in Population and Employment Economics, Faculty of Economics and Business, University of Indonesia

² Faculty of Economics and Business, University of Indonesia

* Correspondence author: birrul.walidain103@gmail.com

Article Info: Received: 2020-10-14; Accepted: 2020-11-20; Published: 2020-12-05

Abstract: The mismatch between educational and occupational qualifications is an issue that still frequently occurs in the Indonesian job market. This study aims to study the probability of educational mismatch in workers and how it was related to the wages received. The data used in this study was gained from the National Labor Force Survey (Sakernas) August 2019. The unit of analysis used are workers that have status as labor/employee/employees who are 15 years old and above. Contingency coefficient analysis was used to investigate the correlation between mismatch and workers' wages, and multinomial logistic regression analysis was used to investigate the determinants of educational mismatch. The results showed that educational mismatch in the Indonesian labor market was still quite high, in which from a total sample of 178.085 workers / laborers, 25,79% were overeducation and 17,98% were undereducation. The results of the contingency coefficient showed that there was a correlation between educational mismatch status and workers' wages. Then based on the result of the multinomial logistic regression test, it was found that workers with overeducation status had a greater chance of those who had a longer length of schooling, who were male and urban, while workers with undereducation status had a greater chance of those with shorter school years, who were female and live in rural areas.

Keywords: overeducation, undereducation, multinomial logistic regression, contingency coefficient, wage

JEL Classification: E24, J3

How to Cite:

Sitorus, F.M., & Wicaksono. P. (2020). The determinant of educational mismatch and its correlation to wages. *Jurnal Ekonomi Pembangunan*, 18 (2), 163-176. DOI: <https://doi.org/10.29259/jep.v28i2.12788>

1. INTRODUCTION

Education is an important asset for individuals to access the labor market. Along with the development of education, it is expected to yield a better rate of return in the form of income in the future (Becker, 1962). It is because better education will improve individual productivity that ultimately affects the wages received.

Education is one of the priorities of the development in many countries. It is because education is important not only as an investment for individuals but also for a country. Human resources who have good qualifications will have a better capacity of productivity so that it may affect the growth of state income (Schultz, 1961). However, the improvements in education must certainly be followed by the improvements in the availability of adequate employment opportunities.

The education system in Indonesia has been improved significantly. It has been started from the development of educational infrastructures that increasingly reaches many regions, the operational assistance for the less fortunate ones, and most recently the issue related to the plan of increasing the length of compulsory education from 9 years to 12 years. One of the outputs of this achievement can be seen from the increasing of net enrollment rate (NER) from year to year during 1994-2019 for all educational levels. Based on data from the Central Statistics Agency (BPS),

<https://ejournal.unsri.ac.id/index.php/jep/index>

DOI: <https://doi.org/10.29259/jep.v18i2.12788>

the most significant increase in NER was at the tertiary education level, which more than doubled from 7.92% in 1994 to 18.85% in 2019.

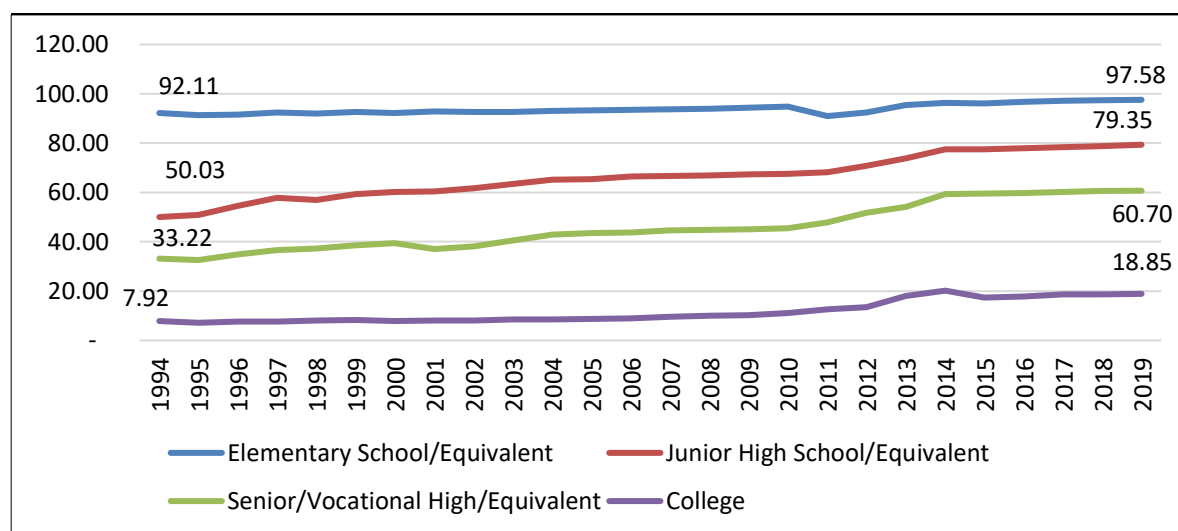


Figure 1. Nett Enrollment Rate in Indonesia, 1994-2019

Source: Central Bureau of Statistics (BPS)

The increase of NER's indicators effects on the increasing of Indonesian workers qualifications. The data of National Labor Force Survey (Sakernas) during 2013-2019 showed that the workers' education quality in Indonesia is getting better. It can be seen from the percentage of workers who have never attended school, which decreased from 28.82% in 2013 to 24.5% in 2019. Meanwhile, university graduates increased from 6.75% to 11.3%.

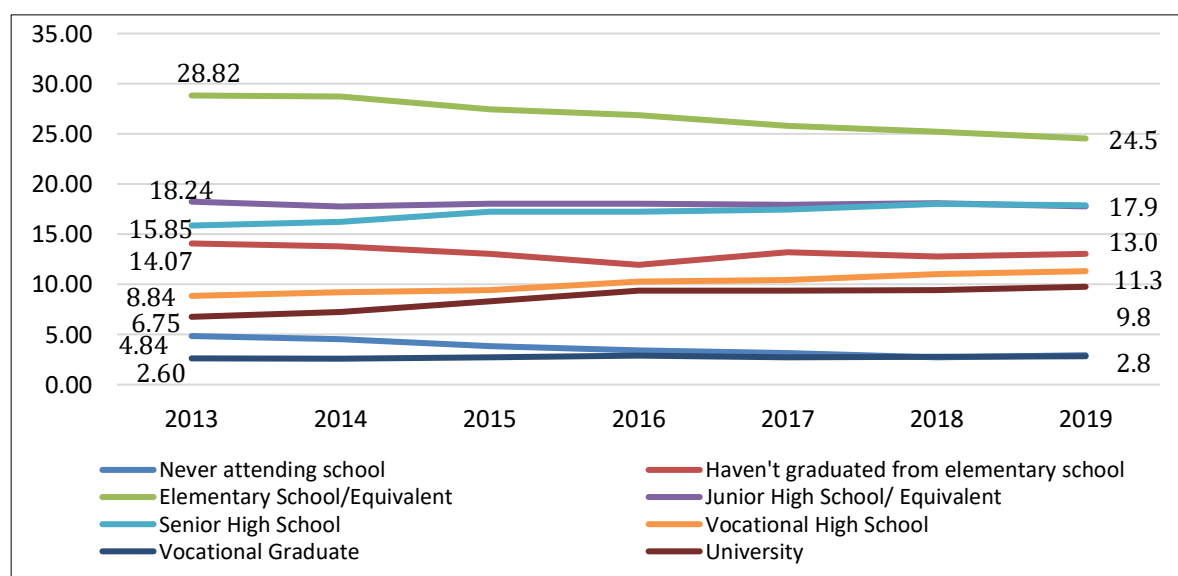


Figure 2. Workforce in Indonesia by Level of Education, 2013-2019

Source: Central Bureau of Statistics (BPS)

High worker education can be a signal of high productivity. However, misallocating the existing work (mismatching) can lead to low productivity (Borjas, 2016; Allen, 2016). The mismatch between educational qualifications and occupation is called educational mismatch. One of the effects of educational mismatch on workers is that the wages received are not what they should be (Montt, 2015).

The phenomenon of educational mismatch itself is still frequently found in the job market. In Indonesia in 2013 there were 29.48% experiencing educational mismatch at work (Hidayatunnismah, 2014). This study uses statistical methods to see educational mismatch status.

Furthermore, in another study from Samudra (2018) it was found that workers with college graduates experienced the greatest mismatch where the percentage of overeducation was 47.74% and 5.59 were under education. This study aims to see what are the deterrence of educational mismatch in workers and how the relationship between educational mismatch status and wages.

Previous studies have only focused on discussing the determinants of educational mismatch in workers. This study tries to make another contribution by adding an association analysis between the mismatch status and workers' income levels through a contingency coefficient analysis. In addition, the measurement of educational mismatch status used a normative method approach rather than statistical methods approaches. This study is expected to become an additional literature about employment research, especially for educational mismatch.

2. LITERATURE REVIEW

2.1. Wage and Education

The difference of wages among workers is closely related to the different education level (Schultz, 1961). Borjas (2016) in the locus of schooling theory states that there is a positive relationship between wages and income. A person will choose a level of education that can maximize his present value in the future. Meanwhile, Todaro & Smith (2015) state that there is a tradeoff between decisions in continuing the education and going to work in which, in the end, those who have higher education get a better rate of return.

2.2. Educational Mismatch

The mismatch experienced by workers in their work is divided into two, namely mismatch in educational qualifications and mismatch in their skills (ILO, 2017; ILO, 2014). Mismatch in qualifications refers to conditions in which the educational qualifications held are not in accordance with the proper job requirements. Meanwhile, the mismatch in skills shows a condition in which the skills workers have are not in accordance with the skills needed at work.

There are two methods that are generally used to measure educational mismatch, namely by looking at them vertically and horizontally. The vertical mismatch method is carried out by comparing the required length of schooling for work to the length of schooling that workers have. Meanwhile, the horizontal mismatch method is carried out by comparing the required education majors for work with the education majors currently owned by the workers (Sloane, 2014).

Table 1. Classification of Educational Mismatch

No	Type of Occupation	Primary	Secondary	Tertiary	Advanced
		Elementary school & below	Junior-senior high school	D1 & D2	D3 – Doctoral degree
1.	Manager	U	U	R	O
2.	Professional	U	U	U	M
3.	Technicians and Associate Professional	U	U	R	O
4.	Clerical Support Workers	U	R	O	O
5.	Services and Sales Workers	U	R	O	O
6.	Skilled Agricultural, Forestry & Fishery Workers	U	R	O	O
7.	Craft and Related Trades Workers	U	R	O	O
8.	Plant and Machine Operators & Assemblers	U	R	O	O
9.	Elementary Occupations	R	O	O	O

Source: (ILO, 2018); (Samudra, 2018)

Note: U= Undereducation; R= Requirededucation; O= Overeducation

Most of studies focused on educational mismatch rather than skill mismatch. It is because the availability of household-based data related to the employment survey focuses on the educational achievement they have. The approach that could be used to measure mismatch might be conducted statistically or normatively (ILO, 2018). A normative approach in vertical mismatch might be carried out by using the International Standard Classification of Occupations (ISCO) cross-classified with the International Standard Classification of Education (ISCED).

Educational mismatch may cause losses both for employee and employer. For the employee, educational mismatch causes the wages received are not in accordance with the qualifications they have. Meanwhile, the employer may lose the productivity potential of unqualified workers (Sattinger, 2012). The workers with overeducation may experience wage-penalties (Allen & Velden, 2001). In another study, it was found that educational mismatch affected job satisfaction and job stability (Montt, 2015).

2.3. Mismatch, education, training, age and gender

The surplus from the length of schooling is not always related to higher productivity (Duncan & Hoffman, 1981). If the existing labor market does not provide many jobs for those with higher education, it could lead to underutilization. It is that is why the role of training is to compensate for job mismatch and reduce the negative effects on wages (Samudra, 2018; Ramirez, 1993).

If viewed from age, the older a person is, indicating that the more work experience they have. Thus, those in the older age group are less likely to experience mismatch. In contrast, the most recent age cohort tends to be overeducation (Duncan & Hoffman, 1981). It is because the younger age group tends to have better educational qualifications. In terms of gender, male workers tend to experience undereducation than female workers (Ramirez, 1993).

2.4. Empirical Study

A study related to determinants of educational mismatch was conducted by Kiker et al (1997) who examined the phenomena of overeducation and under education in the Portuguese labor market. Based on this study, it was found that male workers tended to be overeducation while female workers tended to be undereducation. Then the longer schooling would increase the probability for overeducation. Meanwhile, the workers who had work experience were less likely to have overeducation and undereducation.

In addition, another study conducted by Hidayatunnismah (2014) showed that overeducation had a negative effect on wages and undereducation had a positive effect. In terms of length of schooling, male workers living in urban areas tended to experience overeducation. On the other hand, under-education workers were characterized by briefly going to school, female workers and living in rural areas.

3. MATERIALS AND METHODS

The data used in this study were gained from the raw data of Labor Force Survey in August 2019. Labor force survey is a household-based survey aiming to obtain continuous basic employment data carried out 2 periods in a year, in February 2019 and August 2019 (BPS, 2019). The results of labor force survey in August 2019 provided an estimate rate of the employment until the district level. The analysis unit in this research was the workers with the status of working as laborers/ workers/employees. The number of observation sample units used was 178,085 laborers/ workers/employees throughout Indonesia. The dependent variable in the study was educational mismatch status that was categorized into 3 categories.

The analysis used in this research was descriptive analysis and inferential analysis. Descriptive analysis was used to determine the general description of worker characteristics based on status mismatch as seen in tables and graphs and the contingency coefficient. The contingency coefficient was used to find out the relationship between 2 variables with a nominal scale that could accommodate the number of categories of more than 2 categories (rxk). The educational mismatch variable was categorized into 3, while the wage group was divided into 4 categories.

Table 2. List of variables and the categorization

Variable	Symbol	Operational Definition	Category
Dependent Variable (Y)			
Educational-Job Mismatch	Mismatch	Educational-job mismatch status	1. Requirededucation (RE)* 2. Overeducation (OE) 3. Undereducation (UE)
Independent Variable (X)			
Age	Age	The age of workers (years)	Quantitative Variable
Length of Schooling	LS	The length of schooling (years)	Quantitative Variable
Business field	BF	The workers' business field	1. Agriculture* 2. Services 3. Industry
Residence Classification	RC	Residential area	1. Urban 2. Rural*
Gender	G	The gender of workers	1. Male 2. Female*
Training Experience	Training	The experience of joining the training	1. Have been joining such a training 2. Never joining such a training*

Note: * is the reference of category

The inferential analysis used the multinomial logistic regression analysis method. This analysis was used because the dependent variables had more than 2 categories (Hosmer & Lemeshow, 2000). The logistic regression model formed in general is as follows:

$$\ln\left(\frac{P_1}{P_0}\right) = \beta_{10} + \beta_{11}X_1 + \beta_{12}X_2 + \dots + \beta_{1p}X_p + \varepsilon \quad (1)$$

$$\ln\left(\frac{P_2}{P_0}\right) = \beta_{20} + \beta_{21}X_1 + \beta_{22}X_2 + \dots + \beta_{2p}X_p + \varepsilon \quad (2)$$

Then, the multinomial logistic regression equation model formed in this study is as follows:

$$\text{Overeducation} = \beta_{10} + \beta_{11} \text{Age} + \beta_{12} \text{LS} + \beta_{13} \text{BF}_J + \beta_{14} \text{BF}_I + \beta_{15} \text{RC} + \beta_{16} \text{G} + \beta_{17} \text{Training} + \varepsilon \quad (3)$$

$$\text{Undereducation} = \beta_{20} + \beta_{21} \text{Age} + \beta_{22} \text{LS} + \beta_{23} \text{BF}_J + \beta_{24} \text{BF}_I + \beta_{25} \text{RC} + \beta_{26} \text{G} + \beta_{27} \text{Training} + \varepsilon \quad (4)$$

In which Age is the variable age; LS is a quantitative variable of length of schooling; BFJ is a dummy variable from the service sector business field; BFI is a dummy variable from the industrial sector business field; RC is the dummy variable for the region; G is the dummy variable for gender and training is the dummy variable for experience in training.

4. RESULTS AND DISCUSSION

4.1. General description of workers in Indonesia

The results of the Sakernas (Labor Force Survey) in 2019 showed that the majority of laborers/employees/workers in Indonesia, 56.7%, had jobs in accordance with their educational qualifications. However, the percentage of workers who had a mismatch between educational qualifications and work was still quite high, in which the workers who experienced overeducation were 25.79% and undereducation 17.98%. The phenomenon of overeducation in developing countries such as Indonesia shows that there is limited employment in accordance with the level of education they have so that people are willing to do jobs even though they have higher education than the required job requirements (Safuan & Nazara, 2005).

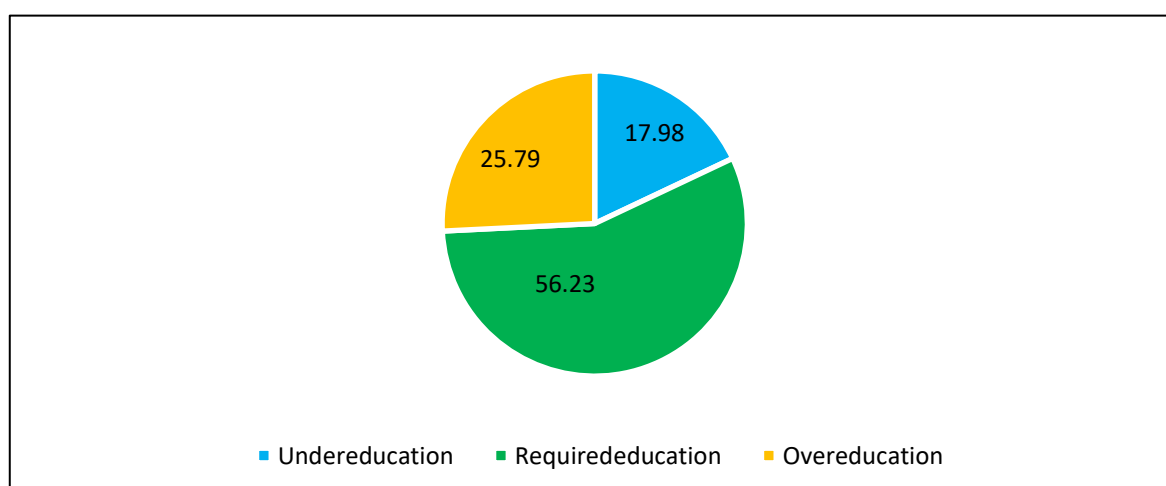


Figure 3. Percentage of educational mismatch on laborers/workers in Indonesia, 2019

Source: National Labor Force Survey 2019 (author's calculation)

The percentage of workers with undereducation itself was lower than that of workers with overeducation. The quality of workers' education in Indonesia have increased from year to year. It is alleged to have contribution to this phenomenon. The phenomenon of overeducation is more likely to occur in workers with higher education than workers with undereducation status.

The majority of workers / laborers / employees in Indonesia have never joined training. Then, if seen from the level of education, the majority of them only attended the junior high school to senior high school (intermediate) levels. In terms of the sex and residential area, more than half of the workers are male and live in urban areas. Moreover, based on their business field, the majority work in the service sector.

Table 3. Percentage of workers according to socio-economic & demographic characteristics, 2019

The Characteristics of Workers	Percentage
Training experience	
• Have joined training	19,6
• Never participated in training	80,4
Business field	
• Agriculture	9,5
• Industry	26,7
• Services	63,7
Regional Classification	
• Urban	64,5
• Rural	35,5
Gender	
• Male	63,8
• Female	36,2

Source: National Labor Force Survey 2019 (author's calculation)

Men have higher mismatch because they are usually more dominant in meeting the needs of their families so they have tendency to not to be picky about jobs. In contrast, women tend to be more selective in choosing jobs. The types of work that can be done by women are also limited, so that there are not many choices. It leads to the match between education and work higher in percentage.

Table 4. Educational Mismatch by socioeconomic and demographic characteristics, 2019

Variable	Educational Mismatch			Total
	Under education	Required education	Over education	
Gender				
Male	19.65	53.82	26.53	100
Female	15.09	60.39	24.52	100
Residential Area				
Urban	15.65	56.12	28.23	100
Rural	21.11	56.38	22.51	100
Business field				
Agriculture	22.28	54.05	23.67	100
Industry	21.80	52.98	25.22	100
Services	15.68	57.96	26.36	100

Source: National Labor Force Survey 2019 (author's calculation)

In terms of residential area, there is no significant difference in the status of required education in urban and rural areas. However, in urban areas, overeducation is higher than in rural areas. It is possible because in urban areas there more workers with higher qualifications that have not been occupied in work field that are suitable for work. In contrast, in rural areas the status of undereducation was higher than urban areas. The workers in rural areas generally have low educational qualifications so that it is possible to do jobs that are not in accordance with the level of education required for the jobs.

Based on the business field, the service sector has higher percentage of required education than the other two sectors. Business fields in the service sector include the trade and transportation sector dominated by workers with lower level of education who are mostly found in the labor market so that the probability of getting a job that is appropriate with their qualifications is greater.

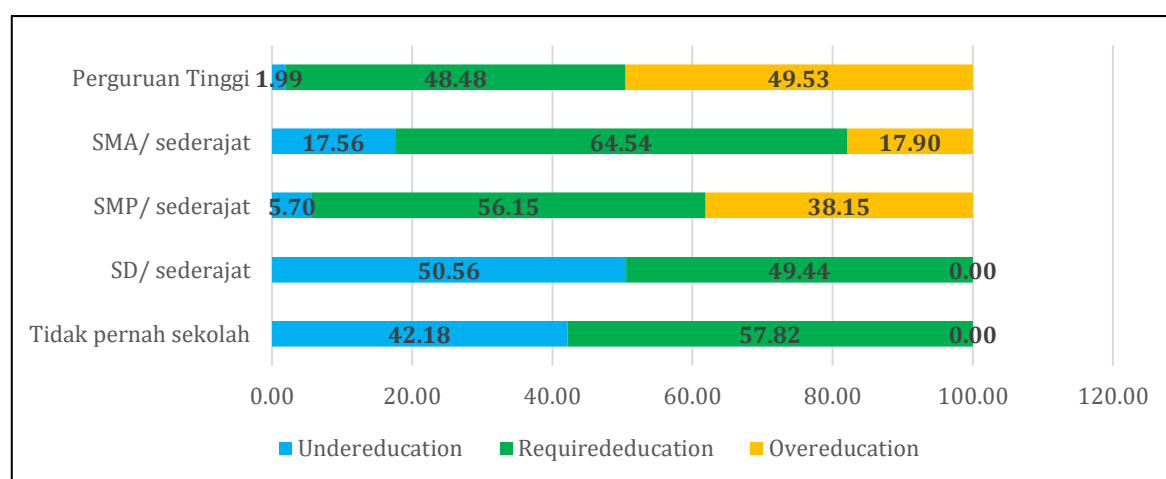


Figure 4. Percentage of educational mismatch based on the highest education completed, 2019

Source: National Labor Force Survey 2019 (author's calculation)

The data of national labor force survey 2019 (Sakernas) show that the higher the education is, the more common the phenomenon of overeducation is. Conversely, the lower the education one has, the greater the tendency for undereducation to occur. It could be seen in the phenomenon of overeducation that is more dominated by the workers who have the college educational background. It indicates that employment opportunities requiring high qualifications are limited so that the workers who graduate from higher education are forced to work for job positions with lower qualifications. Then, for those with primary school education and below, the workers who experienced overeducation were not found at all so that they are likely to be occupied for job

positions with higher education required or for jobs that are in accordance with their educational backgrounds.

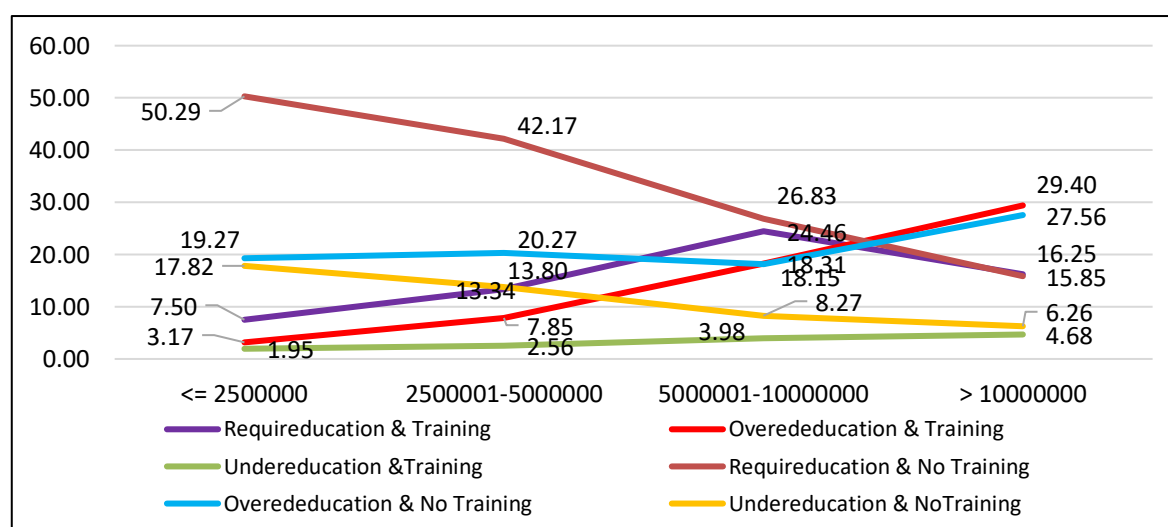


Figure 5. Educaional Mismatch and Training of workers in Indoensia, 2019

Source: National Labor Force Survey 2019 (author's calculation)

Training that has been attended has contributed to increasing productivity as well as reducing the effect of educational mismatch on wages. Based on Figure 6, overeducation workers who do not join any training are encountered with such conditions in which their wage is lower than it should be (penalty wage). However, it is different for overeducation workers who attend such trainings, which end up receiving more wages that is more than 5 million rupiah. This result is in line with research by Konings & Vanormelingen (2010) stating that workers who take part in training tend to have a greater income margin than those who do not.

Based on Table 5, it can be concluded that low-level wages are dominated by workers who are under-education. Meanwhile higher wages are found in overeducation workers. It is in line with Schultz (1961) which state that differences in wages received are related to differences in education. From the results of the contingency coefficient test, it was obtained a significance value of 0.00, which was smaller than $\alpha = 0,05$. It indicates that there is a significant relationship between educational mismatch status and the level of wages received. These results are in line with Hartato's research (2020) examining the relationship between vertical mismatch and wages using the Cramer correlation method.

Table 5. The percentage of workers based on status mismatch and wage levels, 2019

Educational Mismatch Status	Wage Level			
	<= 2.500.000	2.500.001 – 5.000.000	5.000.001 – 10.000.000	> 10.000.000
Undereducation	64,84	29,01	5,40	0,76
Requirededucation	60,60	31,46	7,23	0,71
Overeducation	51,30	34,75	11,20	2,75

Source: National Labor Force Survey 2019 (author's calculation)

4.2. The Determinant of Educational Mismatch

In the first multinomial logistic regression model, the variable that would be affected was the status overeducation variable. Based on the result of the multinomial logistic regression test, it was found that all independent variables had a significant effect on the status of overeducation. The resulted models is showed in Table 6.

$$\begin{aligned} \text{Overeducation} = & -3,63 - 0,007 \text{ Age} + 0,308 \text{ LS} - 1,353 \text{ BF}_J - 0,564 \text{ BF}_I + 0,402 \text{ G} \\ & + 0,222 \text{ RC} - 0,298 \text{ Training} + \varepsilon \end{aligned} \quad (5)$$

Table 6. Estimation of Parameters, Standard Error, Significance, and Odds Ratio of Overeducation

Variable	Coefficient	S.E.	Significance	Odds Ratio
Konstan	-3,630	0,038	0,00*	
Age	- 0,007	0,001	0,00*	0.993
Length of Schooling	0,308	0,002	0,00*	1,360
Business Field				
Services	- 1,353	0,025	0,00*	0,258
Industry	- 0,564	0,025	0,00*	0,569
Gender				
Male	0,402	0,013	0,00*	1,494
Residence Classification				
Urban	0,222	0,013	0,00*	1,249
Training				
Have joined such trainings	- 0,298	0,015	0,00*	0,742

Source: National Labor Force Survey 2019 (author's calculation)

Note: * significant at the 5% level

To investigate the significance of influence each independent variable has, it was carried out by interpreting the odds ratio value of each parameter. Based on the regression output, it can be seen from the age variable that every increasing in age, every one year, will reduce the opportunity for overeducation by 0,993 times. It means that younger workers are more likely to be overeducation than older workers. This finding is in line with Hartog (2000) stating that overeducation diminishes along with the increasing of age and experience. However, the study of Hidayatunnismah (2014) showed the opposite result. In that study, the age variable had a positive effect on the tendency of overeducation, which means that the older is more likely to experience overeducation. Meanwhile, an increase in the length of schooling for one year would cause an increase in overeducation by 1,36 times. Then, in terms of residential areas, the workers who live in urban areas, are 1,49 times more likely to experience overeducation than rural workers.

Table 7. Estimasi Parameter, Standar error, Significance, Odds Ratio of Undereducation

Variable	Coefficient	S.E.	Significance	Odds Ratio
Constant	- 0,576	0,035		
Age	0,012	0,001	0,00*	1,012
Length of Schooling	- 0,175	0,002	0,00*	0,839
Business Field				
Services	0,679	0,025	0,00*	1,972
Industry	0,522	0,025	0,00*	1,685
Gender				
Male	0,231	0,015	0,00*	1,260
Residence Classification				
Urban	- 0,247	0,014	0,00*	0,781
Training				
Have joined such trainings	0,283	0,021	0,00*	1,327

Source: National Labor Force Survey 2019 (author's calculation)

Note: * significant at the 5% level

Further, in the second multinomial logistic regression model, the variable examined to know its influence was the status of undereducation. Based on the multinomial logistic regression test, it was

found that all independent variables had a significant effect on the status of undereducation. The resulted model is showed in Table 7.

$$\begin{aligned} \text{Undereducation} = & -0,576 + 0,012 \text{ Age} - 0,175 \text{ LS} + 0,679 \text{ BF}_j + 0,522 \text{ BF}_l + 0,231 \text{ G} \\ & -0,241 \text{ RC} + 0,283 \text{ Training} + \varepsilon \end{aligned} \quad (6)$$

Based on the odds ratio value of each variable, it can be interpreted that workers working in the industrial sector are 1,68 times more likely to experience undereducation than workers in the agricultural sector. It may be because the industrial sector requires higher educational qualifications than workers in the agricultural sector. Meanwhile, in terms of the age variable, each increase in age, every one year, may increase the opportunity for undereducation workers by 1,01 times. It means that older workers are less likely to be undereducation than younger workers. This finding is in line with a study conducted by (Dahlstedt, 2011) emphasizing that undereducation workers, commonly the older workers, compensate the lack of education with longer work experience. In contrast to the study of Hidayatunnismah (2014) which found the opposite result. In that study, the age variable had a negative effect on the tendency of undereducation, which means that the older the age was, the workers are less likely to experience undereducation.

5. CONCLUSIONS

Based on the results of the National Labor Force Survey (Sakernas) 2019, it was found that as many as 43.77% of laborers/ workers / employees in Indonesia still encountered educational mismatch. The highest educational mismatch status was showed mainly by the workers who were college graduates who tended to be overeducational. It is an indication that there are limited employment opportunities that can accommodate workers with high qualifications.

Contingency coefficient test results showed a relationship between educational mismatch and the level of wages earned. Based on the results of the multinomial logistic regression test, it was found that the overeducation workers had a higher tendency for workers who had long school years, are male, and worked in urban areas. Meanwhile, workers who experienced undereducation had a higher probability for those who had a short length of schooling, are female, lived in rural areas and have never attended training. This study only examined the determinants of educational mismatch status. In subsequent studies, it could be continued by examining how educational mismatch affects the wages received and the intention of worker turnover.

The policy implication that can be applied is by increasing the intensity of job training for workers. Companies can provide relevant training for workers to overcome skill mismatches. Then the government can further optimize the role of training providers such as Work Training Centers (BLK) that may increase the competence of prospective workers so that they are better prepared to enter the labor market or at least be able to open their own employment with their skills.

Government should be able determine another policies to encourage educational institutions and job providers to cooperate through apprenticeship activities. Apprenticeship activities can increase the knowledge of prospective workers that wasn't obtained in school Furthermore, this apprenticeship activity can give work experience for prospective workers that can be used as capital to get a proper job with the required/specific qualifications.

REFERENCES

- Allen, Erma R. (2016). *Analysis of Trends and Challenges in Indonesian Labor Market*. ADB Papers on Indonesia No. 16.
- Allen, J., & van der Velden, R. (2001). Educational mismatches versus skill mismatches: Effects on wages, job satisfaction, and on-the-job search. *Oxford Economic Papers*, 53(3), 434–452. <https://doi.org/10.1093/oep/53.3.434>.
- Badan Pusat Statistik. (2020). *Keadaan Angkatan Kerja di Indonesia Februari 2020*. Jakarta: BPS RI.

- Badan Pusat Statistik. (2019). *Pedoman Pencacah Survei Angkatan Kerja Nasional (Sakernas) 2019*. Jakarta: BPS RI.
- Badan Pusat Statistik. (2019). *Booklet Survei Angkatan Kerja Nasional Agustus 2019*. Jakarta: BPS.
- Becker, G. S. (1962). Investment in Human Capital : A Theoretical Analysis. *Journal of Political Economy*, 70(5), 9–49. <http://www.jstor.com/stable/1829103>.
- Borjas, G. J. (2016). *Labor Economics (Seventh Edition)*. New York: McGraw-Hill Education.
- Dahlstedt, I. (2011). Occupational Match: Over- and Undereducation Among Immigrants in the Swedish Labor Market. *Journal of International Migration and Integration*, 12(3), 349–367. <https://doi.org/10.1007/s12134-010-0172-2>.
- Duncan, G. J., & Hoffman, S. D. (1981). The incidence and wage effects of overeducation. *Economics of Education Review*, 1(1), 75–86. [https://doi.org/10.1016/0272-7757\(81\)90028-5](https://doi.org/10.1016/0272-7757(81)90028-5).
- Hartato, H. (2020). The Analysis of Vertical Mismatch and Manufacturing Labor Wage by Using Cramer's V Method. *Jurnal Public Policy*, 6(1), 1. <https://doi.org/10.35308/jpp.v6i1.1564>.
- Hartog, J. (2000). Over-education and earnings: Where are we, where should we go? *Economics of Education Review*, 19(2), 131–147. [https://doi.org/10.1016/S0272-7757\(99\)00050-3](https://doi.org/10.1016/S0272-7757(99)00050-3).
- Hidayatunnismah. (2014). *Overeducation dan undereducation di Pasar kerja Indonesia dan Dampaknya Terhadap Penghasilan (Analisis Data SAKERNAS 2013)*. Tesis. Depok: Universitas Indonesia.
- Hosmer, David W., Lemeshow, S. (2000). *Applied Logistic Regression Second Edition (Second)*. New York: John Wiley & Sons.
- International Labour Organization. (2018). *Measurement of Qualifications and Skills Mismatches of Persons in Employment*. Geneva: ILO.
- International Labour Organization. (2017). *How Useful Is the Concept of Skills Mismatch?*. Geneva: ILO.
- International Labour Organization. (2014). *Skills Mismatch in Europe*. Geneva: ILO.
- Kiker, B. F., Santos, M. C., & De Oliveira, M. M. (1997). Overeducation and undereducation: Evidence for Portugal. *Economics of Education Review*, 16(2), 111–125. [https://doi.org/10.1016/s0272-7757\(96\)00040-4](https://doi.org/10.1016/s0272-7757(96)00040-4).
- Konings, J., & Vanormelingen, S. (2010). The impact of training on productivity and wages: Firm-level evidence. *IZA Discussion Paper No. 4731*, 1–55.
- Montt, G. (2015). The causes and consequences of field-of-study mismatch: An analysis using PIAAC. *OECD Social, Employment & Migration Working Papers*, 167, 1–89.
- Ramirez, Alfonso A. (1993). The Board of Regents of the University of Wisconsin System Mismatch in the Spanish Labor Market: Overeducation? Mismatch in the Spanish Labor Market Overeducation? *The Journal of Human Resources*, 28(2), 259–278. <http://www.jstor.org/stable/146203>.
- Safuan, S., & Nazara, S. (2005).). Identifikasi Fenomena 'Overeducation' di Pasar Kerja Indonesia. *Jurnal Ekonomi Dan Pembangunan Indonesia*, 6(1), 79–92.
- Samudra, R. R. (2018). Job Mismatch and Age-Earning Profile in Indonesia. In *Paparan Seminar Lembaga Demografi, Fakultas Ekonomi dan Bisnis, Universitas Indonesia*.
- Sattinger, M. (2012). *Assignment Models and Quantitative Mismatches*. Department of Economics, University at Albany.
- Schultz, T. W. (1961). Investment in Human Capital. *American Economic Association*, 51(1), 1–17. <https://www.jstor.org/stable/1818907>.
- Sloane, P. (2014). Overeducation, skill mismatches, and labor market outcomes for college graduates. *IZA World of Labor*, November, 1–10. <https://doi.org/10.15185/izawol.88>.
- Todaro, Michael P & Smith, Stephen C. (2009). *Economic Development*. 11th edition. Boston: Pearson Addison Wesley.

Appendix

Table A. Contingency Coefficient

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2965.838 ^a	6	.000
Likelihood Ratio	2779.231	6	.000
Linear-by-Linear Association	3.258	1	.071
N of Valid Cases	178085		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 399.30.

Symmetric Measures			
		Value	Approx. Sig.
Nominal by Nominal	Contingency Coefficient	.128	.000
N of Valid Cases		178085	

Table B. Multinomial Logistic Regression

Model Fitting Information				
Model	Model Fitting Criteria		Likelihood Ratio Tests	
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	1.152E5			
Final	6.944E4	4.579E4	14	.000

Pseudo R-Square	
Cox and Snell	.227
Nagelkerke	.264
McFadden	.131

Table C. Multinomial Logistic Regression

		Parameter Estimates							
Vertical mismatch								95% Confidence Interval for Exp(B)	
		B	Std. Error	Wald	df	Sig.	Exp(B)	Lower Bound	Upper Bound
Overeducation	Intercept	-3.630	.038	9000.420	1	.000			
	Umur	-.007	.001	158.305	1	.000	.993	.992	.994
	Lama_sekolah	.308	.002	15175.180	1	.000	1.360	1.353	1.367
	[pelatihan=1]	-.298	.015	376.518	1	.000	.742	.720	.765
	[pelatihan=2]	0	.	.	0	.	.	.	.
	[JK=1]	.402	.013	943.049	1	.000	1.494	1.457	1.533
	[JK=2]	0	.	.	0	.	.	.	.
	[Wil=1]	.222	.013	307.191	1	.000	1.249	1.218	1.281
	[Wil=2]	0	.	.	0	.	.	.	.
	[Lap_usaha=1]	-1.353	.025	2871.718	1	.000	.258	.246	.271
	[Lap_usaha=2]	-.564	.025	516.628	1	.000	.569	.542	.598
	[Lap_usaha=3]	0	.	.	0	.	.	.	.
Undereducation	Intercept	-.576	.035	265.721	1	.000			
	Umur	.012	.001	446.909	1	.000	1.012	1.011	1.013
	Lama_sekolah	-.175	.002	9680.904	1	.000	.839	.836	.842
	[pelatihan=1]	.283	.021	184.325	1	.000	1.327	1.274	1.382
	[pelatihan=2]	0	.	.	0	.	.	.	.
	[JK=1]	.231	.015	239.359	1	.000	1.260	1.223	1.297
	[JK=2]	0	.	.	0	.	.	.	.
	[Wil=1]	-.247	.014	303.739	1	.000	.781	.760	.803
	[Wil=2]	0	.	.	0	.	.	.	.
	[Lap_usaha=1]	.679	.025	747.571	1	.000	1.972	1.879	2.071
	[Lap_usaha=2]	.522	.025	449.720	1	.000	1.685	1.605	1.768
	[Lap_usaha=3]	0	.	.	0	.	.	.	.

- The reference category is: Requirededucation.
- This parameter is set to zero because it is redundant.

